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## The Dietitian's Interest to Gain Insight into the Nutrition Black Box

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The role of food for health fostering and health risks is a current topic of newspaper and website headlines. One and the same foodstuff can be declared healthy just to be denied a few weeks later as being harmful. Participation in such a quasi-simple discussion is open to the entire population. Complexity and scientific requirements are ignored, although food is known to be composed of hundreds of ingredients in contrast to well defined medicines composed of one or a few active ingredients in a simple matrix of pure excipients. Blindness for food complexity and challenges is worse than simple oblivion. As contradicting results keep on being published, it is evident that the added value of nutritional science has not yet been communicated in a convenient form.

"Implausible results in human nutrition research – Definitive solutions won't come from another million observational papers or small randomized trials" was the title of John Ioannidis' Editorial in BMJ 2013;347: f6698. Meanwhile, nothing has basically changed. Dietitians go on discussing about a black box. They go on trying to get funding for research which does not bring new knowledge. Often, exploration of objects hidden inside the black box is approached using inappropriate methods such as food frequency questionnaires and further subjective gauges. Instead of expanding basic and translational research into applied research and practice, new research fields are opened which will yield surrogate results but no explanations. Nevertheless, funding for this un noble kind of research is still granted, sometimes even by governmental offices. Such a grant is often more welcome to some researchers and their affiliated institution than a scientifically proper contents of the research project itself. Incentives to change this peculiar pecuniary interest are absent.

Dietitians will have to learn to act as academics. It is no way to counsel clients with skill which have never been updates since graduation. Scientific methods, mainly instrumental methods, are available in life sciences. They are able to go beyond to what dietitian are used to adopt. Dietitians must recognize that methods using questionnaires or qualitative research with focus groups are not nearly as potent as physico-chemical methods, mainly because they cannot be validated according to recognized standards or guidelines such as ICH or GMP. In many current dietetics methods, there is no validation for accuracy or for precision. Variations appear not only between institutions, but even within the own one. Although in an epidemiological sense

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big data mining can return nutritional patterns related to non-communicable diseases (as long as both data groups come from the same population), it is still a personalized condition which favors perfect health or illness of a person. Therefore, dietitians cannot rely any longer on scientifically inappropriate traditions, if promotion of the profession and of the dietetics science should be the declared aim of activities. They need to understand nutrigenomics, epigenetics, and translational research arising from basic research.

Nutritionists and dietitians reach their own limits of professional feasibility, if they keep on trying to retrieve evidence which does not exist. As long as evidence relies on a black box, the term "presumption" would be more appropriate than "evidence". If evidence is lacking, only the ability to recognize and interpret biochemical pathways, pharmacokinetic and pharmacodynamics facts gives these professionals the added value they are aiming at.

COST Action FA 1403 POSITive (Interindividual variation in response to consumption of plant food bioactives and determinants involved) states in its Memorandum of Understanding that the platform "requires sharing of up-to-date knowledge in various disciplines, e.g. nutrition, metabolism, molecular biology, cardio-metabolic health, (epi-)genetics, epidemiology and microbiology". Even more disciplines could be joint if a resolution on how to manage current nutritionally

induced health depletions should be adopted, e.g. biochemistry, pharmacology and toxicology. Nutrition is not only an endless need and sometimes a joy, but also the *conditio sine qua non* for a continuing quality of life, mainly for those who suffer from a disease. Nutrition in this sense is basically linked to a health perspective and to medicine, and not to gastronomy and culinary skill, which would be rather an art than a science.

As a summary, these reflections are the reason why nutritionists and dietitians can no longer ignore methods which have been validated in other scientific research. Nutrition and dietetics will have to pass thresholds and go the way which other disciplines went through before. Traditional medicinal plants have been used across ages to relieve illnesses. Their secrets have been recognized

as a fact, but there were no explanations for mechanisms of action in past centuries. Pharmacognosy had developed to become a true phytochemistry in the second half of the 20<sup>th</sup> century. Biosynthesis of active ingredients and mechanisms of actions of substrates have been decoded by means of modern analytical techniques. It has been recognized that a plant variant has a maximum of a key substrate at a given time of the season and in a given climatic environment. It is this substrate which will have a certain effect if given to the right person at the right time in right dose on the right administration way. The metabolism of such a human being depends on genes and their expression in the environment he or she lives. To get insight into the black box must become the objective of nutritionists and dietitians.